

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

Claim 1 (currently amended): A piezoelectric resonator comprising:

a substrate;

a vibration unit disposed on the substrate and having a structure in which at least one pair of an upper electrode and a lower electrode are opposed to each other, the upper and lower electrodes sandwiching the upper and lower surfaces of an internal thin-film portion including at least one layer of a piezoelectric thin-film; and

an external thin-film portion provided under the lower electrode and including at least one layer of one of a piezoelectric thin-film and a dielectric thin-film; wherein

the vibration unit is vibrated in an n-th harmonic, where n is an integer of 2 or greater, the upper electrode and the lower electrode are located substantially in the positions of the loops of the n-th harmonic; wherein

the external thin-film portion includes an SiO₂ thin-film as a major component;
and

the internal thin-film portion includes AlN as a major component.

Claim 2 (original): A piezoelectric resonator according to claim 1, wherein the n-th harmonic is a second order harmonic, and the film thickness ratio $r = t_o/t_i$ in which t_o represents the thickness of the external thin-film, and t_i represents the thickness of the internal thin-film is set at a value at which the resonance frequency temperature coefficient of the entire piezoelectric resonator is nearly zero.

Claim 3 (original): A piezoelectric resonator according to claim 1, wherein the

respective thin-films of at least one of the internal thin-film portion and the external thin-film portion are combined in such a manner as to have different resonance frequency temperature coefficients.

Claims 4 and 5 (canceled)

Claim 6 (original): A piezoelectric resonator according to claim 1, wherein the substrate has one of a hole and a concavity, and the vibration unit is disposed above the one of the hole and the concavity.

Claim 7 (original): A piezoelectric resonator according to claim 1, wherein the piezoelectric resonator is a thickness-longitudinal vibration type resonator.

Claim 8 (original): A piezoelectric resonator according to claim 1, wherein the substrate has a hole that passes through a top surface to a bottom surface of the substrate and the vibration unit is disposed above the hole.

Claim 9 (original): A piezoelectric resonator according to claim 8, further comprising a diaphragm that is arranged to cover the hole.

Claim 10 (currently amended): A piezoelectric resonator according to claim 1, wherein the opposed electrodes are made of aluminum ~~and the internal thin-film portion is made of zinc oxide.~~

Claim 11 (original): A piezoelectric resonator according to claim 1, wherein the n-th harmonic is a second order harmonic and nodes of the second harmonic exist in the internal and external thin-film portions.

Claim 12 (original): A piezoelectric resonator according to claim 11, wherein the film thickness ratio $r = t_o/t_i$ in which t_o represents the thickness of the external thin-film, and t_i represents the thickness of the internal thin-film is set at a value at which the resonance frequency temperature coefficient of the entire piezoelectric resonator is nearly zero.

Claim 13 (original): A piezoelectric resonator according to claim 12, wherein the film-thickness ratio r is preferably in the range of about 0.6 to about 1.3.

Claim 14 (original): A piezoelectric resonator according to claim 1, wherein the resonance frequency temperature coefficient TCF is about +10 ppm/°C to about -10 ppm/°C.

Claim 15 (original): A piezoelectric resonator according to claim 1, wherein the external thin-film portion includes two layers having different resonance frequency temperature coefficients.

Claim 16 (original): A filter including a plurality of the piezoelectric resonators according to claim 1 and a filter circuit, wherein the electrodes of the piezoelectric resonators are connected to the filter circuit.

Claim 17 (original): A filter including a plurality of the piezoelectric resonators according to claim 1, wherein the piezoelectric resonators are connected in a ladder arrangement.

Claim 18 (original): A duplexer including the filter according to claim 16.

Claim 19 (original): A duplexer including the filter according to claim 17.

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Claim 20 (original): An electronic communication device including at least one piezoelectric resonator according to claim 1.